

U.S. Patent Application Serial No. 10/634,839
Amendment filed January 24, 2005
Reply to OA dated September 22, 2004

REMARKS:

Claims 1-6 are currently being considered, none of which have been amended. No new claims have been added. No new matter has been introduced.

Before turning to the cited references, a brief review of the present invention is in order. The present invention relates to a method for manufacturing a semiconductor device, comprising the steps of: (a) forming a laminated substrate by laminating a device formation layer consisting of single crystalline semiconductor on a supporting substrate consisting of single crystalline semiconductor via an insulating layer wherein a direction of a crystallographic axis of the device formation layer is shifted from a corresponding crystallographic axis of the supporting substrate; (b) forming semiconductor devices on the device formation layer within a plurality of areas divided by scribe lines extending to a direction being parallel to a direction of a crystallographic axis where the supporting substrate is easy to be cleaved; and (c) splitting the laminated substrate into a plurality of chips by cleaving the supporting substrate along the scribe lines.

Claims 1-6 stand rejected under 35 USC 103(a) as obvious over JP 09-246505 (**Kato**), USP 3,054,709 (**Freestone**), and USP 6,596,185 (**Lin**).

Applicants respectfully traverse this rejection.

The Examiner has improperly alleged that “**Freestone et al.** teach to form scribe lines (Figure 2) parallel on a principle plane (and, therefore, parallel to a principle axis) to form wafers with smooth edges and less strain (Column 1 Lines 39 to 41)” (Office Action, page 3, lines 6-8).

Here, the Examiner appears to be confusing a direction of a crystal axis with a crystal plane orientation.

When a face is **parallel** to the principal plane, this means that the face is **perpendicular** to the principal axis. The principle axis is perpendicular to the principle plane.

Freestone states “The slice may be of about 0.020" thick and is preferably cut from the ingot in a manner such that the face of the slice is parallel to a principle plane, preferably a 1.1.1. plane, of the crystal” (column 1, lines 58-61).

For example, when the Miller Index of the principal plane is (111), then the principal plane must be perpendicular to the direction of $\langle 111 \rangle$.

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The Examiner insists, in the section entitled Response to Arguments, that, “if the principle plane chosen was one of the other principle planes, say the 1.0.0. plane as described in Column 2 Lines 21 to 25, then the scribe line would be on a plane face that could be parallel to a direction of the crystallographic axis (see Figure 2)” (Office Action, pages 3-4).

Applicants respectfully disagree with the Examiner’s insistence regarding this matter.

In Fig. 2 of **Freestone**, the drawing sheet is parallel to the principal plane. In other words, the face of the sheet of paper bearing Fig. 2 of **Freestone** is parallel to the principal plane. Therefore, the face of the sheet of paper bearing Fig. 2 of **Freestone** must be perpendicular to the principal axis. Thus, scribe lines parallel to the drawing sheet are perpendicular to the principal axis. **Freestone** does not explain which direction the scribe line is parallel to.

In other words, **Freestone** does not describe, teach, or suggest the direction that the scribe line is parallel to. **Kato** and **Lin** fail to remedy this deficiency of **Freestone**.

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Furthermore, the direction set forth in Applicants' claim 1 would require more than just routine skill in the art as suggested by the Examiner. A particular parameter must first be recognized as a result-effective variable, that is, a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation (see *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977)).

The direction set forth in Applicants' claim 1 was not recognized as a result-effective variable in **Freestone**. Therefore, it is not proper for the Examiner to assert that only routine skill in the art would have been required to discover the features set forth in Applicants' claim 1. In view of this, the Examiner's argument that the direction would be an "obvious" engineering choice is improper, and thus the rejection of claims 1-6 should be withdrawn.

Kato and **Lin** fail to remedy the above-described deficiencies of **Freestone**, regarding the features set forth in claim 1.

Freestone, **Kato**, or **Lin**, alone or in combination, fail to describe, teach, or suggest the following features of claim 1: "(b) forming semiconductor devices on the device formation layer within a plurality of areas divided by scribe lines extending to a direction being parallel to a direction of a crystallographic axis where the supporting substrate is easy to be cleaved; and (c)

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splitting the laminated substrate into a plurality of chips by cleaving the supporting substrate along the scribe lines", in combination with the other claimed features.

Thus, Applicants respectfully submit that this rejection should be withdrawn.

In view of the aforementioned remarks, claims 1-6 are in condition for allowance, which action, at an early date, is requested.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP



Darren R. Crew
Attorney for Applicants
Reg. No. 37,806

DRC/llf
Atty. Docket No. **021331A**
Suite 1000
1725 K Street, N.W.
Washington, D.C. 20006
(202) 659-2930



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Enclosure: Petition for Extension of Time